

Transition Plan for System Security

Maintaining system security through
the energy transition

5 December 2025






We acknowledge the Traditional Custodians of the land, seas and waters across Australia. We honour the wisdom of Aboriginal and Torres Strait Islander Elders past and present and embrace future generations.

We acknowledge that, wherever we work, we do so on Aboriginal and Torres Strait Islander lands. We pay respect to the world's oldest continuing culture and First Nations peoples' deep and continuing connection to Country; and hope that our work can benefit both people and Country.

'Journey of unity: AEMO's Reconciliation Path' by Lani Balzan

AEMO Group is proud to have delivered its first Reconciliation Action Plan in May 2024. *'Journey of unity: AEMO's Reconciliation Path'* was created by Wiradjuri artist Lani Balzan to visually narrate our ongoing journey towards reconciliation – a collaborative endeavour that honours First Nations cultures, fosters mutual understanding, and paves the way for a brighter, more inclusive future.

Read our
RAP 



How to interact today

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- Please ask questions using Slido: www.slido.com Enter: #AEMO
- Enter with your name, no need to log in.
- Ask your questions or up-vote others' questions.
- We will also have an [engagement survey](#) following the webinar for stakeholder feedback.

Today's agenda

Time	Item	Speaker
10:30 am	Acknowledgement and agenda	Angela Heck, Stakeholder Engagement
10:35 am	Introductory remarks	Nicola Falcon, Executive General Manager, System Design
10:40 am	AEMO 2025 Transition Plan for System Security	Chris Mock, Bjorn Sturmberg, Engineering Strategy
11:15 am	Q&A	Niraj Lal, Engineering Strategy
11:50 am	Closing remarks	Chris Davies, Group Manager, Future Energy Systems
11:55 am	Survey and close	Angela Heck, Stakeholder Engagement

Introduction

Nicola Falcon, EGM System Design



Context

NEM Planning and Analysis



Data
 Infrastructure
 Reliability
 Security



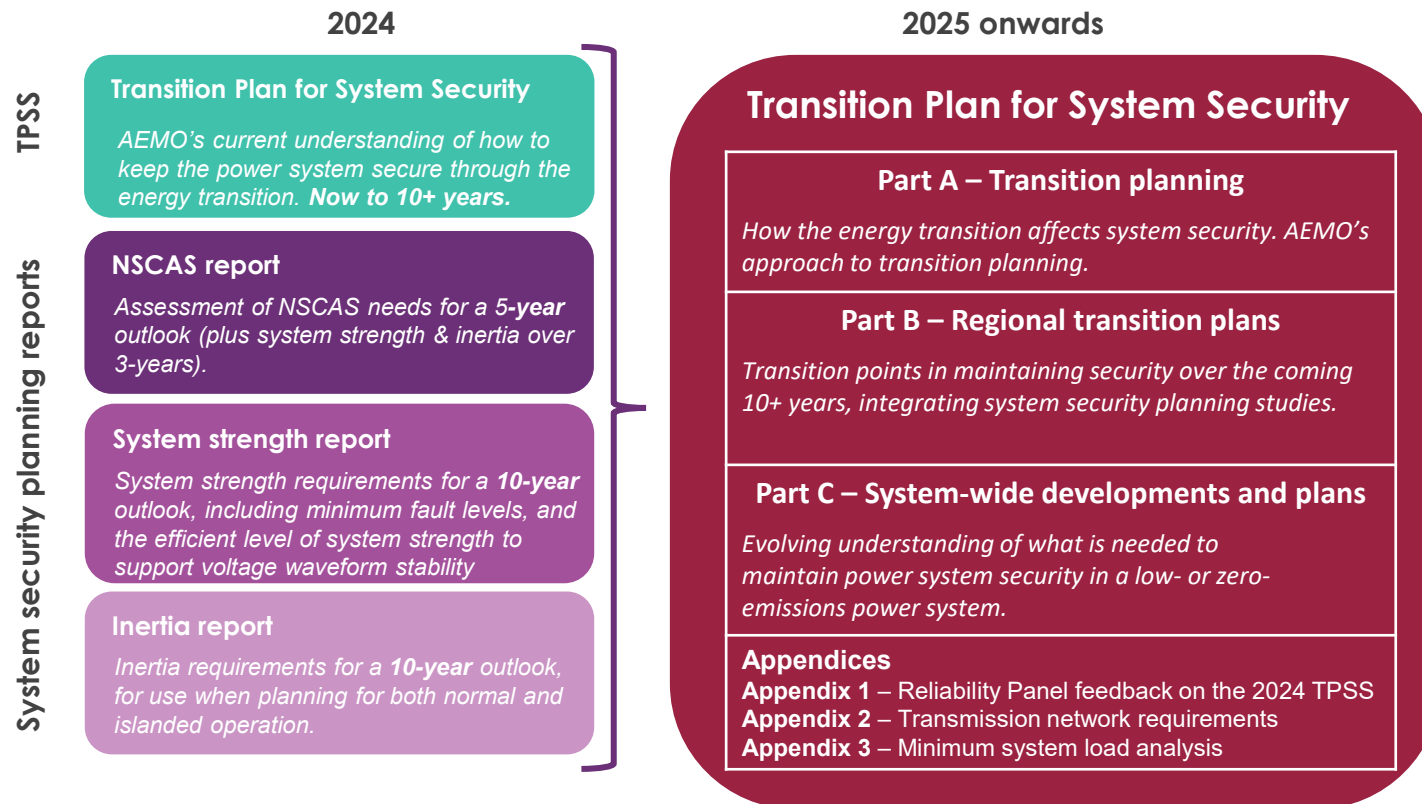
<p>March 2024 ISF rule change</p>	<p>Dec 2024 Initial TPSS Engineering Roadmap resourcing uplift</p>	<p>Dec 2025 TPSS (incl. System Security Reports)</p>	<p>Annually updated Further report consolidation</p>
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2025 Transition Plan for System Security

Chris Mock and Bjorn Sturmborg
Engineering Strategy



AEMO's combined security reports



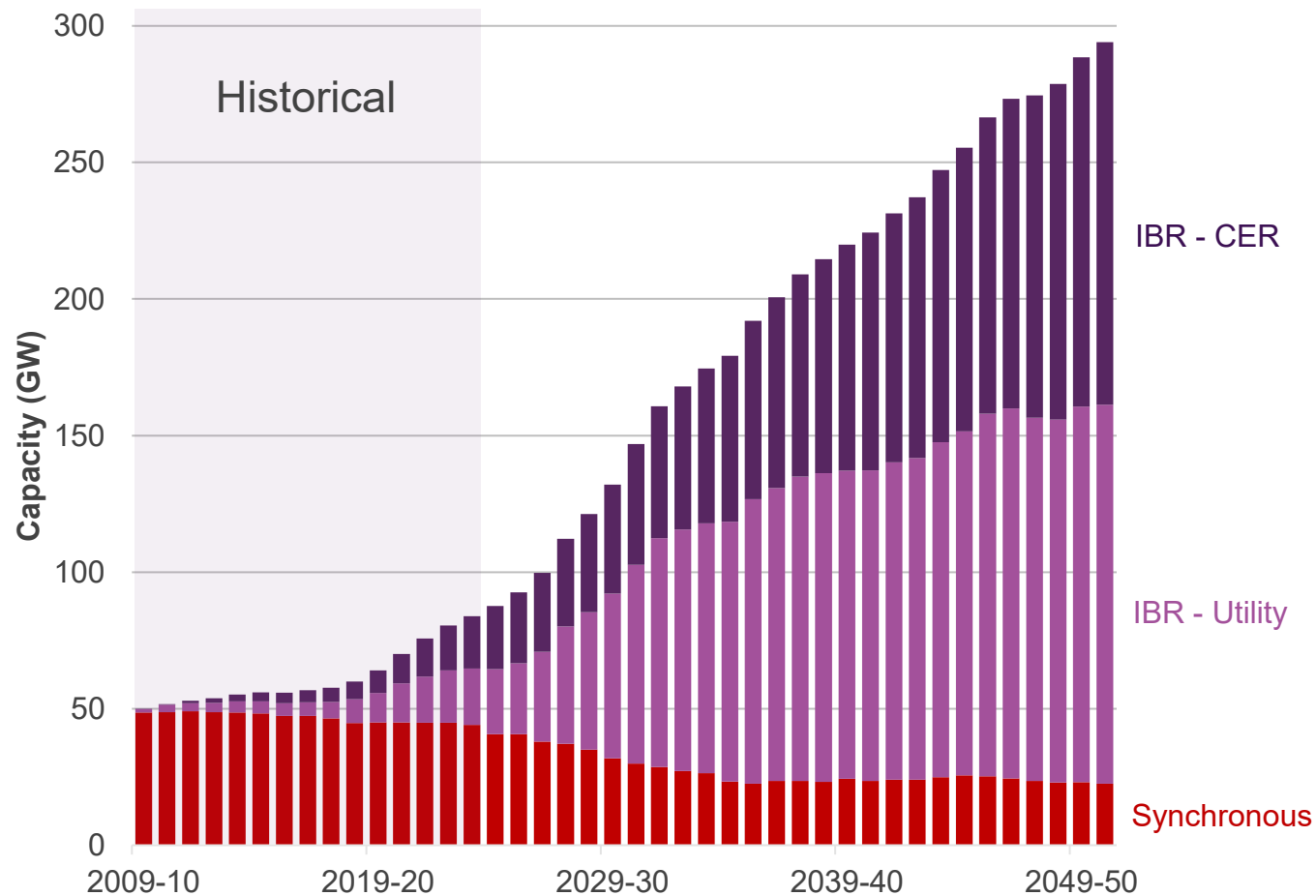
AEMO encourages feedback on the 2025 TPSS, email futureenergy@aemo.com.au by 2 February 2026. Feedback will be published on AEMO's website.

Part A – Transition planning



Decoupling system security from coal generation

Historical and 2024 ISP Step Change scenario of synchronous generation and IBR in the NEM



Technical requirements are enduring, their provision is evolving

A **secure** power system is one operated safely within defined technical limits, with ability to withstand credible disturbances, return to secure operation, and restart following a widespread outage.








Power system criteria

						
System strength	Frequency and inertia	Voltage control	Operability	Resource adequacy	System restoration	Transient and oscillatory stability

AEMO is procuring transitional services

1. To address near-term challenges, and
2. To trial new approaches to maintaining power system security.

Services currently being procured:

-  Managing minimum system load (MSL) events with battery energy storage systems
-  Black start capability from inverter-based resources
-  Zero synchronous generation trial
-  Grid-forming inverter protection-quality fault current
-  System restart under high distributed PV conditions
-  Minimum system load transitional services
-  South Australia grid reference transitional service

Security is a shared responsibility



Network Service Providers

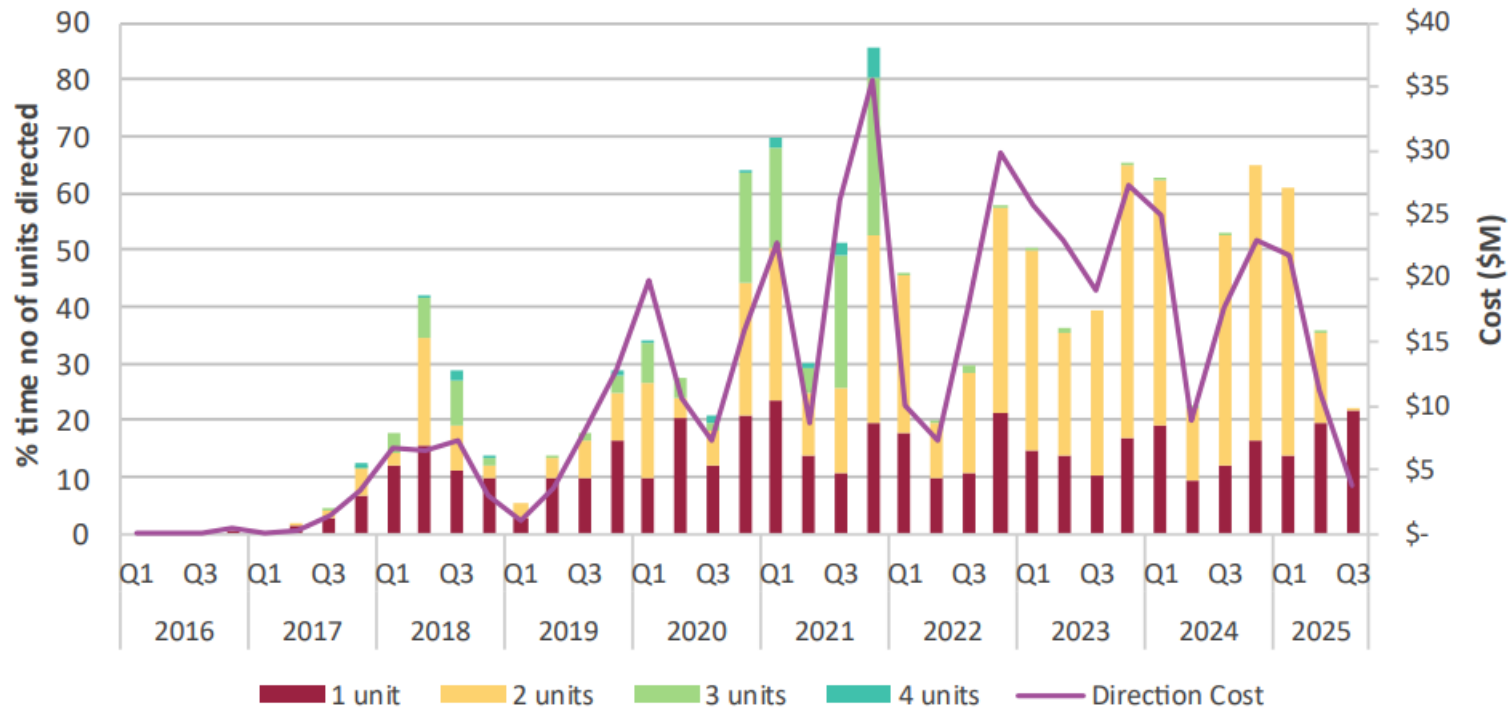


Market participants



AEMO

Directions required to maintain system security in SA



AEMO's transition planning approach

Transition planning is an ongoing proactive body of work that needs to be done to ensure readiness for every transition point.

Transition points are events that require material changes in the operational approach to managing system security.

Horizon 1	Horizon 2	Horizon 3
Operational planning to prepare for imminent transition points	Transition planning in the investment timeframe	Future system needs
0-2 years	2-10 years	10+ years

Example Transition Points

- Major asset changes such as coal power station retirement
- Threshold events, such as projected seasons where operational demand could drop below minimum levels
- Operational changes that could affect how security is maintained, such as reducing the number of synchronous generators required to be online in a region.

Navigating the regional plans

Regional transition summary

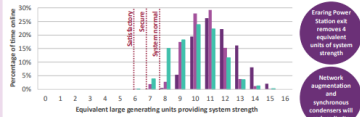
New South Wales

Context
System security in New South Wales is currently heavily reliant on large synchronous generators. Many coal generators are approaching end of life, and some are exploring options for operational flexibility that could include two-shifting and potential seasonal lay-ups. Earing announced exit is currently August 2027 and Baxwater has commented publicly on its two-shifting trial. In October 2025, AEMO has observed an increase in directions issued to maintain system strength in New South Wales.

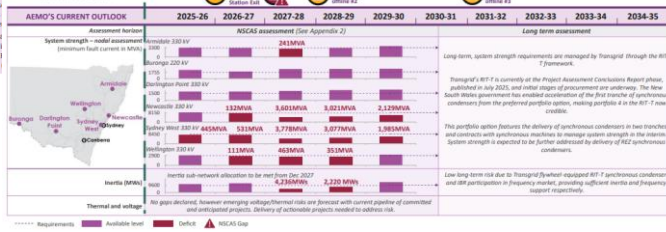
Identified transition points in New South Wales are closely linked to decommissionment of coal generation, which is projected to occur due to market pressures far in advance of announced exit dates. Minimum system load (MSL) conditions are another transition point, with MSL conditions forecast to occur in system normal from Spring 2026.

The New South Wales government is supporting the creation of five renewable energy zones, incorporating new generation, transmission, and synchronous condensers. The government has also aligned its Long Duration Storage Resource Plan (LDSRP) with the creation of these zones, supporting the development of long duration storage and pumped hydro storage.

Maintaining system strength above security limits is increasingly challenging



REGIONAL DEVELOPMENTS	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35
Synchronous generator capacity change	+750	-2,340	-1,100				-40	-420		
Renewable generation	+3,800	+500	+2,847	+1,970	+953					
Committed and anticipated B&A	+1,800	+500	+6,888	+6,276	+3,057					
MSL forecasts (left column) / System strength	+1,800	+500	+6,888	+6,276	+3,057					



Transition point overviews

Earing exit

Q3 2027

Unresolved

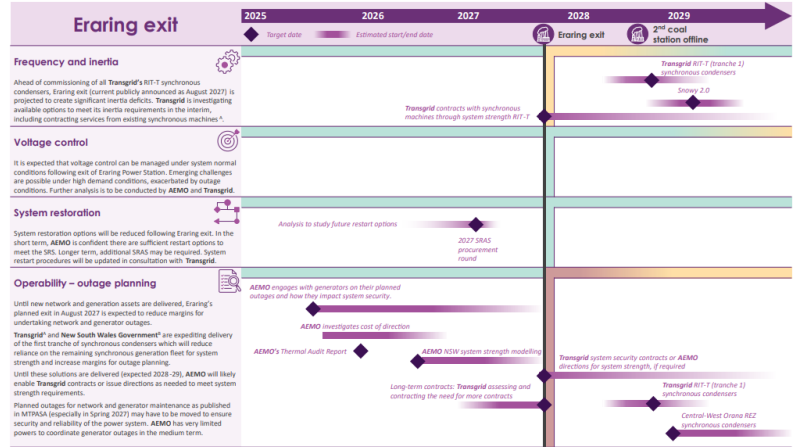
System strength, Frequency and inertia, Voltage control, System restoration, Operability, Resource adequacy, Transient and oscillatory stability

Context
The closure of Earing Power Station will result in four coal generating units with a total generation capacity of 2,880 MW being withdrawn from the New South Wales power system. System strength requirements to enable the planned retirement of Earing Power Station in August 2027 have been identified by AEMO each year since 2021, and Transgrid is progressing the procurement of new synchronous condensers. However, these assets are not currently scheduled to be operational until 2028, even though currently being fast-tracked.

Impact
The exit of Earing Power Station before these synchronous generators are operational would negatively impact system strength and inertia in New South Wales. Minimum generator requirements for system strength may require AEMO to activate Transgrid system strength contracts (where available) or operationally intervene in the market up to 30% of the time. In the event of a credible contingency, gas generation may need to be brought online to meet system strength and reliability requirements. Some gas generation may be unavailable due to gas supply constraints and limited run time. Backup diesel supplies at some gas facilities may provide short-term support, if sufficient coal, gas or hydro generation is not available, such as during outages or coal generators two-shifting. AEMO may need to direct the de-energisation of sections of the transmission network, resulting in localised loss of supply to customers.

Actions
• Transgrid, with the support of the New South Wales government, is fast-tracking investment in the first tranche of synchronous condensers to meet system strength requirements. However, these are not expected to be operational until at least 2028, and are subject to supply chain constraints, project delays, and other risks. Transgrid is seeking to procure system security contracts to fill gaps between exit of Earing and arrival of synchronous condensers. Currently one provider is expected, however, Transgrid's RIT-T identified more contracts would be required.
• AEMO will communicate with generators where planned outages could impact system security so operators can consider changes to outage schedules.
• If currently scheduled outages in Spring 2027 do not change, AEMO will likely need to activate Transgrid's system security contracts and direct one or more generators to shift scheduled outages, or direct others to operate at minimum load or as synchronous condensers based on their capabilities to provide system strength. Based on the current outage schedules, risks of needing to de-energise assets and shed load arise during this time.
• AEMO will also ensure all operational procedures, processes, and constraints are updated to account for changes in system conditions. As a precautionary measure, AEMO will work with Transgrid to prepare a procedure on which sections of the transmission network may be de-energised and consult with the New South Wales Jurisdictional System Security Coordinator (JSSCC).
• AEMO is completing preparatory work to facilitate small signal stability analysis that incorporates system changes associated with the exit of Earing and other synchronous generators. This aims to ensure that stabilising devices effectively damp inter-area modes. This work is expected to be well progressed in 2026.

Security criteria assessment



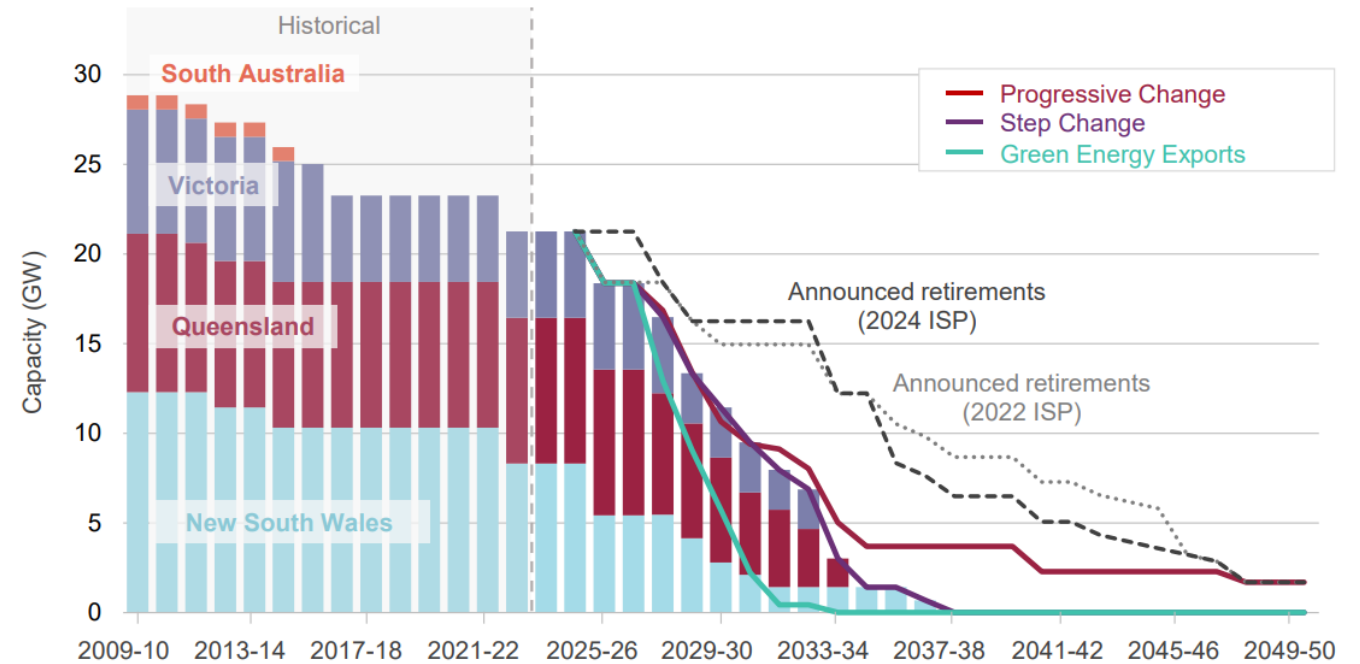
The TPSS contains eight coal transition points

Replacement services are needed well in advance of retirement – as coal stations increasingly withdraw or decommit from the power system:

- operationally for maintenance
- or commercially for hours, days or seasons

Two types of coal transition points:

- ‘Offline’ points assess readiness for temporary decommitment
- ‘Exit’ points assess readiness for permanent retirement



NEM coal capacity - 2024 ISP

Minimum System Load

Minimum System Load (MSL) refers to thresholds needed to keep the system in balance and enable generators to provide essential system services

MSL management strategies

- Deploy new sources of system services
- Store energy
- Increase daytime demand
- Reduce non-essential generation

MSL operational tools




- Issue market notices
- Recall outages
- Decommit non-essential large-scale generators
- Coordinate storage through contracts or directions
- DNSP actions – e.g. controlled loads, emergency solar backstops, reverse-feeder shedding

There remains an urgent need to increase emergency backstop capacity to manage rare, but plausible, onerous system conditions. If developments outlined in the TPSS proceed and demand grows as forecast, then use of emergency backstops will remain rare.

NEM Transition Points


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Transition points are events that require material changes in the operational approach to managing system security.

Industry readiness for transition points

-  Complete/on track
-  Moderate readiness
-  Unresolved issues

QLD

 Qld MSL 2026


 QLD 1st coal station potentially offline, 2027


 Gladstone exit, 2029

NSW

 NSW MSL 2026


 Eraring exit, 2027

 NSW 2nd coal station potentially offline, 2029

 NSW 3rd coal station potentially offline, 2031-32

SA


 SA MSL 2026


 SA zero min sync generators 2027

VIC

 VIC MSL 2026

 Yallourn exit, 2028

 VIC 2nd coal station potentially offline 2031-32

 VIC 3rd coal station potentially offline 2033-34

TAS

 Project Marinus 2031-32

Part C – System-wide developments and plans



Part C – Table of Contents

What is needed to achieve *power system security* in a low- or zero-emissions system, and the work AEMO is undertaking to improve this understanding.

Transmission level

1. Evolving operation of thermal fleet
2. Future system restart
3. Frequency control
4. Protection & control systems
5. Non-credible contingencies

Distribution level

1. **Operating a high DER system**
2. Enabling a two-sided system

Technologies

1. **Grid-forming inverters**
2. Hybrid gas turbines with clutches
3. Large inverter-based loads
4. Emerging technologies

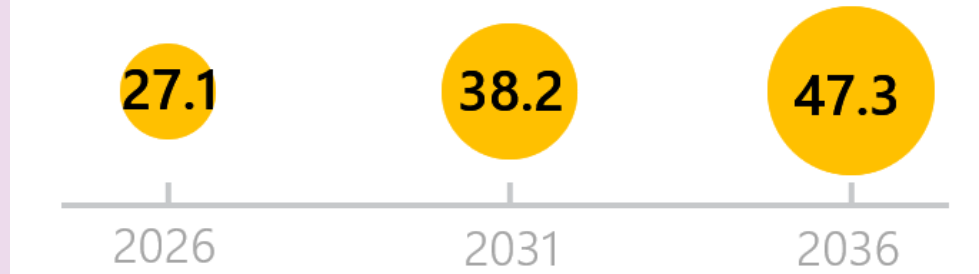
Horizon 3

AEMO's Engineering Roadmap

Operating a high DPV system

AEMO is supporting continued growth in distributed PV (DPV) over the next 10 years.

Installed DPV (GW) 2025 Step Change scenario



MSL challenges are being addressed:

- management strategies are implemented
- system security is decoupled from coal.

AEMO expects new issues will arise as DPV contributions increase. The TPSS contains studies of emerging issues.

Build high-DPV model (2031)

Assess against system criteria and identify high-DPV implications

Identify required further studies

Engage with NSPs, industry, research community, international peers to prioritise and complete studies

Integrate outcomes into system security management

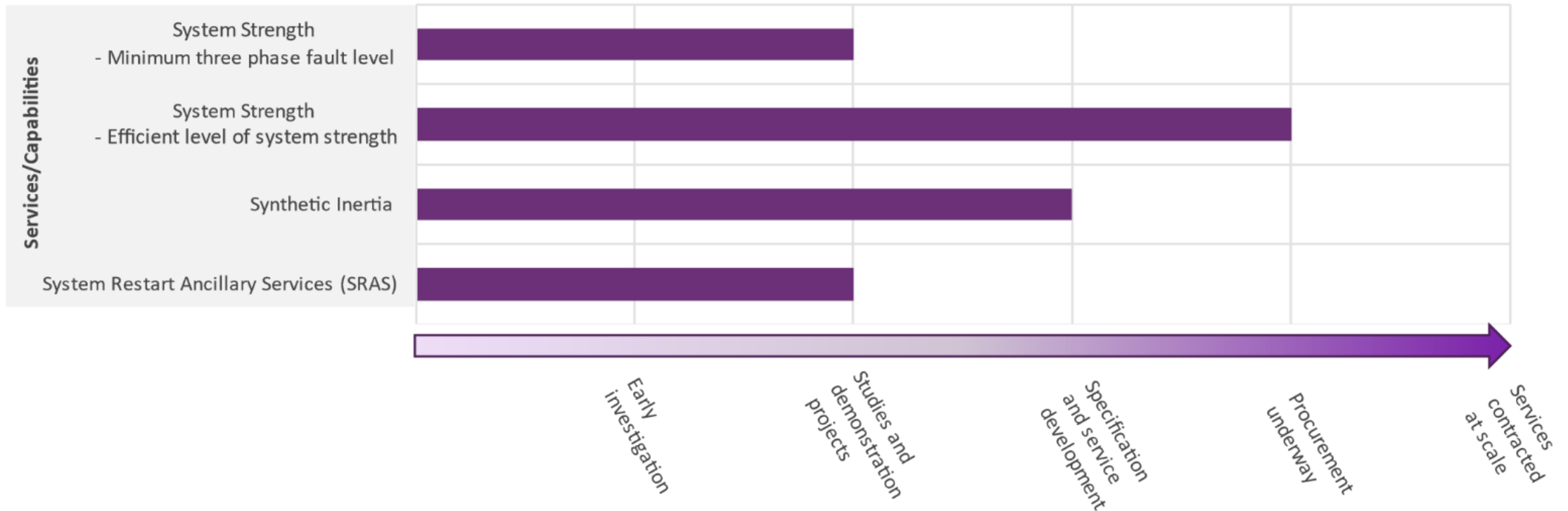
Grid-forming inverters

Defining features of different inverters

Grid-following inverters (GFL)
Control system **synchronises** to the grid voltage waveform




Grid-forming inverters (GFM)
Control system **sets its own** internal voltage waveform

Progress towards delivering security services at scale



Grid-forming inverters

	2025	Forward plans
System strength – minimum fault level	AEMO commissioned 2 consultant reports AEMO survey of TNSP protection	AEMO studies and HIL testing (Eng Roadmap)
System strength – stable voltage waveform		TNSP multi-GW pipeline in RIT-Ts AEMO quantify contributions (Eng Roadmap)
Synthetic inertia	AEMO studies AEMO Inertia Network Services Specification	TNSP procurement as of 2 Dec 2025 (ISF)
System restart		AEMO Type 2 Transitional Service

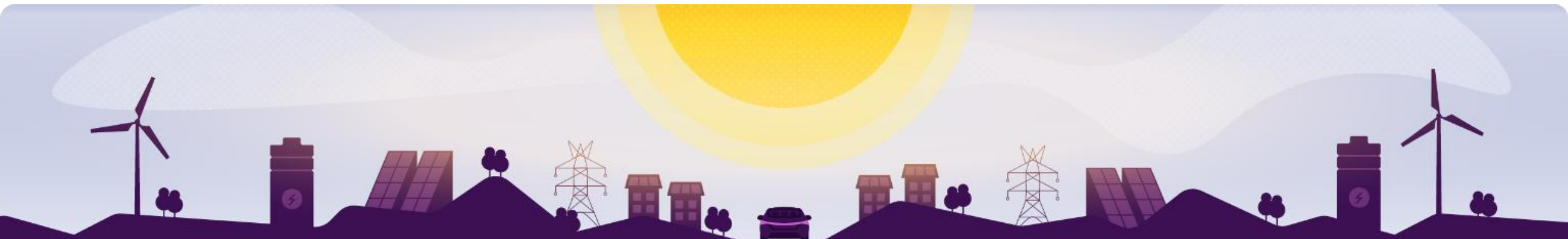
	2025	Forward plans
Standards	AEMO simulation tests against GFM Voluntary Specification	AEMC Access Standards Review
Trials	AEMO Statements of Need for Type 2 Transitional Services	<ul style="list-style-type: none">  Zero synchronous generation trial  Grid-forming inverter protection-quality fault current  Black start capability from inverter-based resources

Summary

AEMO 2025 Transition Plan for System Security

- Part A – Transition planning
- Part B – Regional transition plans
- Part C – System-wide developments and plans
- Appendices

Timely investments are needed to decouple reliance on coal generators for system security – enabling the next phase of the energy transition.



Q&A

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Next steps and feedback

- Draft 2026 ISP – release date 10 December 2025
- Ongoing AEMO planning, analysis and engineering activities
- 2026 Transition Plan for System Security – informed by stakeholder feedback
- Publication webinar survey

Questions

1. What was most useful in this year's Transition Plan for System Security that would be useful in future?
2. What additional information would help stakeholder decision-making on investments that support system security?
3. Where is additional effort required to maintain system security while transitioning to higher contributions of renewables?
4. How best should Engineering Roadmap content be merged and balanced with the system security information in the next Transition Plan for System Security?
5. Do you have any feedback on how AEMO can/should continue to engage on technical matters?

Interested stakeholders are encouraged to submit responses to futureenergy@aemo.com.au by 2 February 2026.



For more information visit

aemo.com.au